REMARKS

The application has been amended to comply with the Examiner's formal rejections, along with thanks for his careful treatment of this application.

A red-marked set of four of the drawings sheets is enclosed which attend to the Examiner's objections. Approval of these changes is requested. After approval is received, formal drawings will promptly be submitted

The number of claims has been reduced to comply with the spirit of the Examiner's comments about a possible objection in the event of allowance of claim 2. It is believed that the claims as now submitted are reasonable in number and in scope.

Claims 8 and 29 were indicated to be allowable. New claim 33 includes the same "allowable feature, and should also be allowable. They continue to be submitted as dependent claims pending the disposition of their parent claims.

Claims 5, 14-16, 18, 21-15, 27-29 and 32 have been cancelled.

To facilitate the prosecution of this application. The undersigned states that the following claims derive their patentability from their parent claim or claims, and will therefore not be separately argued: claims 2-4,6,7,10-13,19 and 20.

This leaves for discussion the following claims: claims

1,9,17,30, and 31.

This invention is a system for accelerating the mass transfer of a gas into a liquid. This is accomplished by passage of the water through an injector where treatment gas is brought into a system under pressure (the system being under pressure from beginning to end), followed by passage through a collider and a reactor in either order, and finally a fluid release. Optionally the fluid release can include means to separate unreacted treatment gas from the liquid stream. The claims include various combinations of these features, and specific claims to a specific collider and to a specific reactor.

The objective of this invention is to treat a confined flowing liquid stream under pressure. Until the final release, the stream does not encounter a chamber or a tank. In particular, the collider has two nozzles whose emissions intersect and combine back into a pipe on its way to a reactor, which also is confined. This means that the stream with its bubbles of gas is closely confined and vigorously "massaged", under pressure. In its preferred form, the collider's two nozzles are provided with twisting vanes that substantially improve the overall performance of the collider. Claims including this feature of the collider have been indicated to be allowed.

Some claims also or instead define a reactor which has a

number of specifically defined reversals and changes of path, and which also improve the function of both the reactor and of the system which includes it. This large number of reversals and intersections of flow paths greatly increase the exercising of the stream in a surprisingly short lengths of the part.

As the Examiner correctly states, Mazzei '312 shows an injector and a degasser. He does not show a collider or a reactor. Hoppe '866 is cited to show a "collider" which is shown merely as a generic static mixer. Hoppe does not show or suggest the incorporation of any specific or any especially useful form of a collider, nor a collider at all. Especially it does not show one with twisting vanes in two nozzles

In view of this, Reed has been cited, which does show a collider with two nozzles. The incentive to place a collider such as Reed's in Mazzei at all is not shown or suggested. The objective of placing a two nozzle collider in the place of generic mixer is not suggested.

Claim 1 was rejected on Benskin in view of Mazzei '128. This claim recites an injector, a collider, a reactor, and a fluid release so that the system is always under pressure. The rejection regards the differences as merely the substitution of a specific eductor for a generically-shown eductor. Instead the difference in the systems reside in the collider and in the reactor.

As to the collider, Benskin shows two nozzles discharging into a tank, directed toward each other. Claim 1 as now recited emphasizes a construction which differs markedly from this. In Benskin, the discharge forces are quickly attenuated by the surrounding material in the tank. In applicant's collider, these are in a chamber where they collide and together go out through a single exit always under system pressure. This is a different concept than simply mixing a circulating flow as Benskin describes at his Col 2 lines 36-40.

It is submitted that Benskin and Mazzei combined is not suggested by either one alone, and that claim 1 is properly allowable.

Claim 9, which depends from Claim 1 additionally defines a specific reactor provided with vanes, slots, joggles, cove surfaces and reflecting surfaces which provide greatly improved mixing in a surprisingly short part length. The Examiner adds Baranowski '124 to the rejection of claim 1 to reject this claim. Baranowski does show a static mixer. He provides vanes to spirally twist and mix gases. He does not provide for reversal of parts of the flows, direct passages through slots, and lateral collisions and reflections. The reactors are very different in concept, and in fact have different objectives. Of course both want to mix fluids.

Baranowski mixes air and gaseous fuel. Applicant, instead,

injects gas bubbles into a liquid stream and vigorously "massages" this stream to accelerate solution of the gas into the liquid. This kind of mixing and acceleration of solution is not contemplated by Baranowski, and would not, it is believed, improve the rate of solution anywhere near as fast as applicant's reactor does. It is submitted that these features improve the overall function of the system, and are not obvious or suggested by the references or their combinations.

Claim 17 recites the combination of an injector and a collider (no reactor), and a fluid release. It has been rejected over Mazzei '312 with Hoppe '866. The Examiner observes correctly that Mazzei does not disclose a collider. Hoppe '866 is cited for his showing of a static mixer 20 generically shown in the drawings and described only as maybe having spiral vanes. This is not a collider as defined in the claims, wherein the streams from two nozzles a confined chamber intersect and flow out together through a single exit, always under pressure. Hoppe suggest only mixing, but not necessarily the class of mixing provided by this invention.

Here Reed '718 should be discussed. Reed divides a stream into two branches, and reunites them. This is done not to mix two components together, and has nothing to do with treating the incoming system fluids. Instead it is intended to provide a shear section into which some additional substance is injected

(through line 60). There is no intended usage to treat the incoming existing stream. For this reason, Reed does not suggest or show the use of any collider in a system such as is defined in this application.

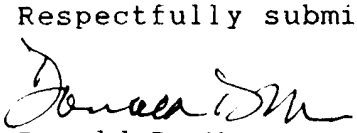
Claim 26 relates to the specific collider per se. It has been amended to include the limitations of allowed claim 29 (which is cancelled). It is therefore allowable.

Claim 30 was rejected on Baranowski. It is directed to the specific reactor. Baranowski has been discussed above, and those remarks are referred here. More particularly, Baranowski does not show any reversal of parts of the flow path. Instead he twists the stream. Applicant's multiple reflections, straight through and lateral passage are not shown or suggested.

It is respectfully submitted that the claims as now presented are allowable. A diligent effort has been made to respond to all rejections and requirements, at the same time reducing if possible, the burden on all concerned. Any omissions will have been unintended, and will promptly be corrected when the undersigned is notified.

Reconsideration of this application, allowance of the claims and passage to publication are respectfully solicited.

Respectfully submitted,



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